

## **Criterion 6, Indicator 47 Area and per cent of forest land used for subsistence purposes**

### **Contacts:**

Marla R. Emery  
Research Geographer  
USDA Forest Service Northeastern Research Station  
Aiken Forestry Sciences Laboratory  
705 Spear Street, P.O. Box 968  
Burlington, VT 05402-0968  
(802)951-6771 ext. 1020  
[memery@fs.fed.us](mailto:memery@fs.fed.us)

Alan R. Pierce  
Independent Scholar  
1061 Mountainview  
Waterbury, VT 05676  
(802)244-5875  
[arp@sover.net](mailto:arp@sover.net)

Robert Schroeder  
Regional Subsistence Coordinator  
USDA Forest Service, Alaska Region  
709 W. 9<sup>th</sup> Street, P.O. Box 21628  
Juneau Alaska 99801-1807  
(907)586-7895  
[rschroeder@fs.fed.us](mailto:rschroeder@fs.fed.us)

### **I. Indicator presentations**

#### **A. Rationale for use of the indicator**

##### **1. Rationale from the March 30, 2000, Technical Notes on Criterion 6, Indicator 47:**

“This indicator measures the extent to which forest land is used to provide basic products for survival outside the economic or market-based system. Such uses of the forest can be valid and their extent should be known and forest management regimes developed to provide for them.”

##### **2. Interpretation from the Technical Notes:**

“Knowing the area of forest to which subsistence users have had access in the past would assist in interpreting initial values obtained for this indicator. Changes in the size or proportion of forest land used for subsistence purposes may indicate the extent to which forests continue to be so used. Interpretation is likely to benefit from input from the indigenous and/or other subsistence users of the forest.

The values of the indicators should be interpreted in relation to management objectives during the period between recordings.”

##### **3. U.S. clarification of the indicator:**

The glossary of terms, adopted at the 12<sup>th</sup> meeting of the Working Group, defines subsistence as:

“The harvesting or growing of products directly for personal or family livelihood. Subsistence needs generally include foodstuffs, fuelwood, clothing and shelter. Subsistence goods can be considered any goods that are substitutes for a market good.”

Three legal canons provide additional guidance for defining the specific characteristics of subsistence in the United States:

1. ANILCA -- The Alaska National Interest Land Conservation Act (P.L. 96-487, Dec. 2, 1980) defines subsistence uses as:  
“the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade. ”  
(Section 803). In addition, the Act states that “the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives...is essential to Native physical, economic, traditional, and cultural existence and to non-Native physical, economic, traditional, and social existence” (Section 801).
2. Federal treaty commitments -- The U.S. federal courts and the Supreme Court consistently have upheld the rights of American Indians to hunt, fish, trap, and gather on reservations and on treaty-specified lands off reservations. In a decision that continues to be foundational for treaty law, the U.S. Supreme Court described access to wildlife as “not much less necessary to the existence of the Indians than the atmosphere they breathed [, 1905 #14].”
3. The Hawaii State constitution -- Traditional and subsistence rights of Native Hawaiians are recognized and protected by Hawaii’s Constitution. Article XII, Section 7 reads:  
“The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua’a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights”

Thus, legal mandate, complemented by research conducted throughout the nation, clarifies some key features of subsistence activities in the contemporary United States.

- Subsistence activities not only have unique legal and cultural standing for indigenous communities, but also have multicultural importance
- Subsistence includes customary trade and barter outside the formal market economy
- Subsistence activities assure cultural as well as material survival
- Subsistence activities take place within mixed-economic livelihood systems

#### B. Data available to quantify the indicator

The Alaska Department of Fish and Game, Division of Subsistence, has conducted research on subsistence for more than 20 years. Data include quantitative measures of community harvest and use of subsistence resources, harvest volumes, and harvest areas. Data collection has emphasized use of fish and wildlife, with fewer data available on the use of plant materials. U.S. federal agencies, including the Forest Service, Park Service, and Fish and Wildlife Service collect similar data for lands they manage in Alaska. Qualitative studies and small-scale surveys have documented subsistence uses by communities throughout the contiguous 48 states. Similar studies undoubtedly have been conducted in Hawaii. However, we were not in possession of any at the time of reporting. The Alaska data appear to be the only large-scale quantitative measures of subsistence currently available in the United States.

In order to present a more extensive report on subsistence uses of forests in the United States, we undertook a three-pronged investigation. The first avenue of research involved identifying various federal, state, county, and private forest land managers and collecting regionally representative samples of policies and regulations governing access to lands for subsistence hunting, fishing, and gathering. Collected regulations yielded fairly consistent characterizations of land available for subsistence and illustrated general access and use limitations. A parallel investigation of the literature on subsistence use of natural resources was undertaken. The literature review was augmented by interviews with resource managers, sociologists, anthropologists, and other authorities using a snowball, or network, sampling technique.

## 1. Access to forest lands for subsistence

Though hunting, fishing, and gathering regulations are guided by concerns for the conservation of species -- a critical consideration for the long-term sustainability of subsistence practices -- these regulations are tailored primarily for recreational and commercial uses (Glass et al. 1990). Subsistence users rarely are considered in the formulation of harvesting regulations unless they are part of a legally recognized group. Thus, in addition to explicit closures of land, regulations such as season limits, bag limits, size limits, permit costs, equipment restrictions, and prohibitions on harvesting of individual species and plant parts may pose barriers to subsistence use of forests. The following review of regulations by land ownership may be combined with data on forest acres by ownership in 1997 (Smith 2001) to estimate the area and percentage of forest legally available for subsistence use.

### *National Park Service*

General National Park Service (NPS) rules and regulations are found in the Code of Federal Regulations, Title 36 (National Archives and Records Administration 2001). When a new park or monument is established, the U.S. Congress has the power to designate whether activities, such as hunting and fishing, will be allowed within the new NPS lands. Within each park, the superintendent is permitted to outline additional regulations (in a park compendium) that supplements the Code of Federal Regulations and applies specifically to the lands under his or her supervision.

In general, subsistence activities are more restricted on National Park Service lands than on other federal lands, such as those administered by the Forest Service and the Bureau of Land Management. Due to ANILCA, hunting, fishing, and gathering of natural resources for subsistence use is allowed on the vast majority of NPS lands in Alaska. In the contiguous 48 states, fishing is widely permitted on NPS lands (which includes National Recreational Areas, National Monuments, and Historical Sites in addition to National Parks). Any restrictions on fishing in National Parks usually involve issues such as endangered species, critical habitat areas, research and monitoring areas, size and catch limits, and prohibition on the use of certain types of bait or equipment.

Typically, the older national parks in the contiguous 48 states do not permit hunting. For example, hunting is not permitted in the following well-known parks: Acadia (Maine, 39,000 acres), the Great Smoky Mountains (Tennessee, 520,000 acres), Isle Royale (Michigan, 134,000 acres), Yellowstone (Wyoming, 2.1 million acres), Glacier (Montana, 1 million acres), Mount Rainier (Washington, 235,625 acres), Yosemite (California, 748,000 acres) and Olympic (Washington, 922,000 acres). A tally of NPS lands that do not permit hunting has not been assembled, but would likely represent a sizable amount of acreage. Hunting is allowed on some NPS lands designated as National Seashores, National Preserves, or National Recreation Areas. Examples of NPS lands where hunting is permitted include the Cape Cod National Seashore (Massachusetts, 27,000 acres), Assateague Island National Seashore (Maryland, 48,000 acres), Big Cypress National Preserve (Florida, 729,000 acres), Big Thicket National Preserve (Texas, 97,000 acres), Pictured Rocks National Lakeshore (Michigan, 73,000 acres), Curecanti National

Recreation Area (Colorado, 42,000 acres) and Whiskeytown-Shasta-Trinity National Recreation Area (California, 403,000 acres).

Gathering on NPS lands is quite restricted. Park Service pamphlets imply that gathering is prohibited, usually inserting the statement “no picking of wildflowers is permitted” within text forbidding damage to parks. Park compendia reveal that the NPS allows limited collection of edible reproductive propagules (fruits and nuts, with occasional permission of mushroom harvesting) for personal consumption only. The collection of leaves, roots, and whole plants is not allowed in the great majority of national parks save for special circumstances. Examples of special circumstances include traditional collection of ramps (*Allium tricoccum*) in the Great Smoky Mountains National Park in Tennessee and North Carolina, and collection of plants, fish, and wildlife by Native Americans, under special permit, for subsistence and/or traditional use purposes in Yosemite National Park. Hawaii Volcanoes National Park also allows for collection of a wide range of natural products by Native Hawaiians. The Park’s compendium (Hawaii Volcanoes National Park Compendium 1999) lists nearly 30 species (including fruits, barks, nuts, and roots) that may be collected (by permit) for traditional use, including plants with dye qualities, plants used for crafts or cordage, plants with medicinal value, and plants with domestic value. Yellowstone and Yosemite are among the national parks that discourage collection of edibles; those parks’ compendia explicitly prohibit the taking of native fruits from the premises for preserving.

#### *U.S. Forest Service*

Forest Service (USFS) lands usually are open to the public for hunting and fishing in accordance with applicable state regulations. USFS policies on gathering are currently under review. In 2000, the United States Congress approved legislation that directs the Secretary of Agriculture to establish and implement a pilot program of charges and fees for forest botanical products, which were defined as “any naturally occurring mushrooms, fungi, flowers, seeds, roots, bark, leaves, and other vegetation (or portion thereof) that grow on National Forest System lands” (P.L. 106-113, § 339(a)). The legislation directs the USFS to charge and collect fair market value for forest botanical products harvested on land in their jurisdiction. In addition, the law mandates analyses to address how and whether such products can be harvested on a sustainable basis. The legislation also recognizes nonmarket values of these products in that it exempts materials harvested for personal use from charges and fees. The Code of Federal Regulations for this legislation were due to be published in Spring 2002. Presumably, the exemption of material harvested for personal use will apply to most subsistence gathering. However, the details of the regulations will determine their effects on activities such as customary trade.

#### *Bureau of Land Management*

Bureau of Land Management (BLM) lands are generally open to the public for hunting, fishing, and gathering. Like the Forest Service, the NPS, and most other public land managers, the BLM distinguishes between gathering for personal consumption and for commercial purposes. BLM policy on gathering (Bureau of Land Management 1994) is found under 43 CFR 8365.1-5 and reads:

“43 CFR 8365.1 5(a) On all public lands, unless otherwise authorized, no person shall: willfully deface, remove, or destroy plants or their parts, soil, rocks or minerals, or cave resources, except as permitted under paragraph (b) or (c) of this paragraph. 43CFR 8365.1-5(b): Except on developed recreation sites and areas, or where otherwise prohibited and posted, it is permissible to collect from the public lands reasonable amounts of the following for noncommercial purposes: (1) Commonly available, renewable resources such as flowers, berries, nuts, seeds, cones, and leaves.”

BLM (1994) regional regulations further state that “reasonable amounts” under CFR 8365.1-5(b)(1) for Oregon include 25 pounds of beargrass, conifer boughs, greenery, and moss per person per year, two bushels of cones per person per year, one bushel of cone seeds and 5 gallons of mushrooms per species per person per year with no more than one gallon per person per day. The regulations for Washington

(Bureau of Land Management 1994) in 1994 were more stringent: 5 pounds of beargrass, conifer boughs, greenery and moss per person per year, 2 bushels of cones, 1 bushel of cone seeds and 5 gallons of mushrooms per species per person per year (with a limit of 3 gallons of mushrooms per person per day in Washington). Gathering of more than the limits would require a permit from the BLM.

#### *Fish and Wildlife Service*

The U.S. Fish and Wildlife Service (USFWS) manages 537 refuges totaling more than 95 million acres (U.S. Fish and Wildlife Service 2001). Hunting and fishing is permitted on some Fish and Wildlife Service lands. Policy guiding the mission of the refuge system is found in the Federal Registry's (National Archives and Records Administration, 2000) 66 FR 3668 (January 16, 2000), Section 1.6F: "To foster understanding and instill appreciation of native fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation".

Of the 537 refuges managed by USFWS, 302 allow hunting and 268 allow fishing (Marler pers. comm. 2002)<sup>1</sup>. Thus more than 40 percent of USFWS refuges are closed to fishing or hunting. Gathering of plants on USFWS lands is allowed if it does not conflict with management goals and may require a permit.

#### *Departments of Defense and Energy*

The general policy for U.S. Department of Defense (DoD) lands is one of allowing public access. DoD (1996) Instruction 4715.3: Environmental Conservation Program reads:

"People and their social, economic, and national security needs are an integral part of ecological systems, and management of ecosystems depends on sensitivity to those issues. Consistent with mission requirements, actions should support multiple use (e.g., outdoor recreation, hunting, fishing, forest timber products, and agricultural outleasing) and sustainable development by meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The DoD's (1996) environmental regulations allow use of lands by Native Americans for traditional/subsistence purposes as long as such uses do not compromise department interests and mission.

"Native Americans shall have access to DoD sites and resources that are of religious importance, or that are important to the continuance of their cultures (e.g. areas containing traditionally used plants and traditionally used hunting areas), consistent with the military mission, appropriate laws (42 U.S.C. 1996, reference (d)), and regulations, and subject to the same safety, security, and resource considerations as the general public."

Notwithstanding the DoD's policy of allowing land under their jurisdiction to be available to the public, a number of military bases around the country are understandably closed to the public for security or safety reasons. Access to DoD lands was severely curtailed or prohibited in the autumn of 2001 due to the threat of terrorism. A survey of the internet found that a large number of military bases from Florida to Alaska closed or shortened their hunting seasons in 2001.

The U.S. Department of Energy (DoE) lands account for a relatively small number of acres in the United States. These lands also usually are open to the public for subsistence activities. However, like DoD lands, future access to DoE lands may be curtailed out of concern for national security.

### *State Lands*

State-owned public lands fall into two major categories: state forests and state parks. States also manage land designated for special purposes, such as fish and game or, in the west, school lands and other properties. State forests usually are maintained as open access lands for the public with respect to hunting and fishing. In many cases, collection of plant material on state lands is restricted to fruiting bodies of plants. Fishing tends to be allowed on state park lands but many restrict hunting and gathering.

Events of the last 2 years demonstrate that state or municipal lands can be suddenly closed to public access. In April of 2001, the 26,000-acre Tahoma State Forest in Washington was closed to the public for several months after the discovery of a methamphetamine lab (Washington State Department of Natural Resources 2001). Another instance involved New York City reservoirs and city-owned watershed lands, which were closed to recreational uses, including fishing, hiking, and hunting, in September 2001 because of concerns over possible terrorist attacks (City of New York Department of Environmental Protection 2001). These lands have subsequently been reopened to the public, but now require that all visitors obtain a public access permit.

### *County Lands*

Hunting and fishing is allowed on most county lands in the United States, subject to state regulations and fish and game laws. Minnesota and Wisconsin contain the largest amount of county forest lands in the country (both by volume and as a percentage), with 2.66 million acres and 5.6 million acres respectively (Smith et al. 2001). In the case of Aitkin County, Minnesota, access to county lands (222,000 acres) for hunting and fishing is “for the most part unlimited. The county may, however, limit the mode of access to certain parcels depending on the type of access road. In certain situations access may only be by foot” (S. Turner, personal communication 2002).<sup>2</sup> Gathering of plants is more restricted on county lands. According to Turner, collection of nuts and berries is allowed without restriction. However harvesting of trees, tree parts (bark, foliage), and roots is usually restricted or prohibited

According to Jacobs (personal communication 2002)<sup>3</sup> Minnesota counties have similar structures, but there may be slight differences in regulations from county to county. However, it appears that the general guidelines outlined above for Aitkin County are representative of other Minnesota county land regulations.

### *Tribal Lands*

Hunting, fishing, and gathering are high priorities for federally recognized tribes. The Native American Fish and Wildlife Society<sup>4</sup> and its affiliate organizations were founded to safeguard the legal and ecological basis for practices that American Indians and Alaska Natives consider fundamental to their survival as peoples. In the contiguous 48 states, treaties and subsequent legal decisions have affirmed the right of tribes to govern hunting, fishing, trapping, and gathering by both tribal and nontribal members (Pevar 1992; Wests 1998) on the 17.3 million acres of forested land on reservations (Table 47.1). Tribes determine eligibility to harvest on their lands and set seasons and harvest limits. They also institute programs for inventory, monitoring, restoration, and protection of culturally important species. Conversations with several Bureau of Indian Affairs (BIA) Regional Foresters confirm that subsistence hunting, fishing, and gathering are important activities on tribal forest lands. Legal tests also have upheld the rights of tribes in the Great Lakes and Pacific Northwest regions to regulate the hunting, fishing, and gathering activities of their members on off-reservation lands where such rights were guaranteed by treaty. In the Pacific Northwest, this includes all “open and public lands” (largely national forests and state lands) in the traditional territories of federally recognized tribes (Whistler 2002). In the Great Lakes region, these lands comprise an additional 35.5 million acres of land on which subsistence activities can be assumed to take place (Bureau of Indian Affairs 2000).

Table 47.1. -- Reservation and tribal forest land areas in USDA Forest Service Resource Protection Act regions (including both Trust and Nontrust forested reservations)

Region, subregion	Reservation acres	Forested acres
Northeast	383,234	285,232
North Central	1,503,991	1,047,150
<b>North Total:</b>	<b>1,887,225</b>	<b>1,332,382</b>
Southeast	230,650	93,048
South Central	1,903,282	233,638
<b>South Total:</b>	<b>1,323,932</b>	<b>326,686</b>
Great Plains	5,918,709	239,676
Intermountain	42,239,504	13,072,137
<b>Rocky Mountain Total:</b>	<b>48,158,213</b>	<b>13,311,813</b>
Pacific Coast (Alaska)	1,316,372	565,814
Pacific Northwest	3,368,127	2,168,329
Pacific Southwest	417,349	197,634
<b>Pacific Coast Total:</b>	<b>5,101,848</b>	<b>2,931,777</b>
<b>U.S. Total</b>	<b>56,471,218</b>	<b>17,902,658</b>

Source: Bureau of Indian Affairs, Branch of Forest Resources Planning (2002)

#### *Nonindustrial Private Lands*

Approximately 48% of all timberlands in the United States (362,796,000 acres) are owned by non-industrial private forestland (NIPF) owners, with the majority of NIPFs located in the eastern states. Access to these lands is becoming increasingly restricted. Of the nearly 1.2 billion acres of forested and non-forested private, non-industrial rural lands in the U.S., Cordell et al. (1990) found that:

Currently, more than 350 million acres of nonindustrial private land are closed to all but the exclusive use of owners. Thus, about one-third of nonindustrial private land is not available for public recreation. Access to another 556 million acres was estimated to be restricted to persons who were personally acquainted with owners. These restricted or partially-restricted lands provide an important recreation resource for many, but only about 23% (283 million acres) of nonindustrial, privately-owned rural land is open to the general public for recreation. More than 80% of this is open free of charge or for a daily fee. The rest is available through exclusive lease agreements involving either a seasonal or annual fee...Since 1977, the percentage of private nonindustrial lands open for public use has decreased from over 29% to 23%. This represents a decrease of nearly 75 million acres of potential recreational land, mostly in the East.

While Cordell et al.'s findings concern both forested and non-forested lands, and cover a wide range of recreational activities in addition to hunting, fishing and gathering, the data nonetheless demonstrate a growing trend in reduced access to private nonindustrial lands. Factors propelling the decline in access to private lands for recreational opportunities include problems with damage and littering, owner desire for privacy/exclusivity, lack of incentives for opening property, competing land uses/land conversion, and concerns over liability (Cordell et al. 1990; Allen et al. 1984).

While these findings address both forested and nonforested lands and cover a wide range of recreational activities, this data nonetheless demonstrates a growing trend in diminishing access to private nonindustrial lands. As hunting and fishing are activities that fall within the Cordell et al. study, it can be inferred that access to private forest lands for subsistence hunting, fishing, and gathering is decreasing.

Posting of land, the placement on property boundaries of signs stating that trespass laws will be enforced, appears to be on the rise. Siemer and Brown's (1993) survey of New York private landowners found that 13.9 million acres, or more than 60 percent of New York's private lands, were posted in upstate New York in 1991. Posting does not necessarily mean that owners do not allow hunting on their lands, but posting may nonetheless create a barrier (actual and perceived) for subsistence hunters, anglers, and gatherers. Siemer and Brown (1993) report that nearly a quarter of all New York private lands essentially are closed to hunting and an additional 56 percent are maintained for the exclusive use of a few. In some regions, hunters seeking access are likely to be turned away by nine out of ten private landowners. In Vermont, the amount of land posted nearly doubled between 1987 and 2000, from 108,914 acres to 204,921 acres (Pollak, 2001).

Leasing lands for hunting and recreation is becoming increasingly popular for NIPFs as well, particularly for larger landowners. Cordell et al. (1990) found about 4 percent of NIPF land nationwide to be leased, with the area subject to lease or fee arrangements almost doubling between 1977 and 1986. The average lease fee per acre on private land in 1986 was \$2.97, or about \$89 per lessee. For subsistence resource-dependent rural people, \$89 may be an unbearable expense. Certainly few subsistence hunters could afford the higher fees mentioned by Patterson and Patterson (1989), which range from \$75 for half a day's hunt to \$5,000-\$8,000 seasonal fees for exclusive game resorts in Texas.

On "open" private lands, persons pursuing hunting, fishing, or plant collection legally must conform to trespass laws. A review of the trespass laws in 26 eastern states (Alt et al. 1989) reveals a notable differences from state to state. Alt et al. (1989) summarized the variety of trespass laws this way:

"Most states require some consent from the landowner or tenant before persons may enter on land for hunting, fishing, trapping and so forth, although a few only require consent for going on "posted" lands. At the other end of the spectrum are states which require written permission to be carried on the person of every hunter, fisher, trapper, etc. (p.1)."

#### *Forest Industry Lands*

Forest industries own 67.7 million acres of timberland in the United States, equal to approximately 9 percent of the total forested lands in the country (Smith et al. 2001). Because industry lands are often large tracts, they provide critical subsistence opportunities to the public. Rural residents have traditionally used industry lands as "commons" for hunting, fishing, gathering, and recreation.

A trend toward limiting access or closing access to industry lands is evident since the mid-twentieth century. Kaiser and Wright (1985) and Cordell et al. (1990) cite studies that estimate the amount of forest industry lands open to the public in 1960 was nearly 97 percent of a then-owned 68 million acres. By 1977, that figure had fallen to 58 percent. This trend reflects increased leasing of lands for hunting and other forms of recreation by forest industry companies. Leasing is attractive to industries because it limits public access, generates income, and limits liability and policing because lessees (either individuals or hunting clubs) usually are required to purchase liability insurance and patrol the land during hunting season (Patterson and Patterson 1989). Capozzi and Dawson's (2001) survey of New York forest industries found that about 75 percent of the 1.2 million acres was leased for recreation, including hunting. Marsinko et al.'s (1998) survey of industry holdings in the south likewise reveals a high percentage of land, 73.9 percent of a total surveyed 22.7 million acres, in lease programs. Region-wide for the south, Marsinko et al. (1998) found that nearly 65 percent of lands were leased to hunting clubs, with rates for individual states approaching levels of 90% (Table 47.2). Forest industries in the south also leased a little more than 9 percent of their lands to public wildlife management areas (Marsinko et al. 1998) that are managed by states and open to the public, usually for a fee (Table 47.3).



Table 47.2. Forest industry lands leased to hunt clubs and individuals in the southern United States (1994)

State	Av. Fee (\$/Acre)	Acres Owned	Acres Leased	Percent Leased
Alabama	3.11	2,744,707	1,823,400	66.4
Arkansas	2.15	1,597,608	1,249,429	78.2
Florida	3.11	3,987,284	2,425,349	60.8
Georgia	3.01	3,861,806	2,988,828	77.4
Louisiana	2.76	1,143,338	665,814	58.2
Mississippi	1.69	1,103,084	836,131	75.8
North Carolina	2.29	1,548,719	1,385,308	89.4
South Carolina	3.28	1,441,926	954,268	66.2
Tennessee	2.03	877,520	159,954	18.2
Texas	2.47	2,769,000	1,563,912	56.5
Virginia	2.01	354,302	229,502	64.8
Other	1.90	1,299,500	385,800	29.7
Total	2.76	22,728,794	14,667,695	64.5

Source: Marsinko et al. 1998.

Table 47.3. Forest Industry Land Leased to State-Administered Wildlife Management Areas in the South.

State	Av. Fee (\$/acre)	Acres Owned	Acres Leased	Percent Leased
Alabama	0.00	2,744,707	77,000	2.9
Arkansas	0.69	1,597,608	243,088	15.2
Florida	1.86	3,987,284	583,762	14.6
Georgia	2.67	3,861,806	171,477	4.4
Louisiana	0.24	1,143,338	109,480	8.8
North Carolina	1.57	1,548,719	49,070	3.2
South Carolina	2.12	1,441,926	346,159	24.0
Tennessee	0.66	877,520	80,500	9.2
Other	0.38	5,525,886	470,200	8.5
Total	0.66	22,728,794	2,130,736	9.4

Marsinko et al. (1998) found that the recreational lease fees charged by industries increased 28 percent between 1989 and 1994 to an average annual fee of \$2.76 per acre. All companies surveyed by Marsinko et al. (1998) engaged in some form of leasing. While leasing appears to be most prominent on forest industry holdings in the eastern states, Messmer et al. (1998) report that fee-access programs are on the rise in the western United States as well. Leasing likely excludes subsistence hunters, anglers, and gatherers because they cannot afford to apply for a lease or enroll in a hunting or fishing club that leases forest industry acreage.

#### *Urban and Municipal Forests*

There are no firm figures for the amount of urban and municipal forests in the United States. The National Research Council (1998) estimated the amount of urban forests at more than 20 million acres. According to Dwyer et al. (2000), urban areas occupy 3.5 percent of the total U.S. acreage while

metropolitan areas account for 25 percent of the country's total acreage. Estimates of canopy cover for urban and metropolitan areas are 27 and 33 percent, respectively.

Despite the existence of large numbers of urban poor, little research has examined urban subsistence uses of natural resources. Clearly, obtaining natural resources in urban environments is difficult and largely illegal or quasi-legal. Hunting is not allowed in urban forests and metropolitan areas due to safety considerations. Fishing usually is allowed in urban and municipal parks, though regulations vary across the country and concerns have been raised about the consumption of fish from urban and metropolitan waters. Pratt et al.'s (2000) report on urban Oregon ecosystems reports that poor water quality can have localized effects on "drinking water, human health, recreational opportunities, aesthetics, biodiversity, such as salmon, *subsistence fishing by the poor*, and economic development (p.109 – emphasis added)." The extent and importance of subsistence fishing in urban areas remains to be studied.

Collecting plants usually is prohibited or very strictly controlled in urban and municipal parks. Despite the near prohibition, a number of people from diverse ethnic and racial backgrounds collect plants and fungi from urban and municipal forests (see Community Resources 2000). The extent to which urban plants and fungi may serve as subsistence resources remains unstudied.

## 2. Regional use of subsistence resources

A review of the literature uncovered a number of regional studies that explicitly or tacitly lend evidence to support the argument that subsistence activities occur in various regions across the United States. Brief summaries of regional subsistence research in the United States are given below. These studies support Muth et al.'s (1987) contention that "sizable subpopulations exist in many rural areas of industrialized North America whose resource utilization strategies can more accurately be characterized as subsistence, although their harvesting activities are managed under policies governing recreational use, commercial use, or native rights" (p. 514).

### *Alaska*

As previously noted, the Alaska National Interest Land Conservation Act (ANILCA, Public Law 96-487 Dec. 2, 1980) guarantees the priority of subsistence uses of fish, wildlife, and plant material for rural residents in the allocation of these resources on forested lands throughout the state. One gauge of the importance of subsistence issues in Alaska is the state and federal resources dedicated to subsistence questions. The State of Alaska has supported the Subsistence Division within its Department of Fish and Game since 1978. The USFS Alaska subsistence program employs more than 10 staff equivalents working on subsistence and supports more than \$2 million in information gathering studies a year. Other federal agencies, including NPS, USFWS, BLM, and the BIA also have sizable subsistence staffs. Budget expenditures for the federal subsistence program have been about \$20 million per year in recent years.

In 1990, the State of Alaska found itself unable to comply with ANILCA provisions; its constitutional equal access clause prohibits providing a priority for *rural* subsistence uses. Since that time, the federal government has had the management authority for subsistence on federal lands and waters in the state. This authority is exercised through the Federal Subsistence Board, made up of the heads of the four land managing federal agencies (i.e., BLM, NPS, USFS, and USFWS) and the BIA. Regional councils, made up of both Native and non-Native subsistence users in each of 10 regions in the state, make fish and wildlife management recommendations to this board. In addition, subsistence has been a central concern for more than 200 federally recognized Alaskan tribes, as well as regional and statewide Native organizations.<sup>4</sup>

Given this unique level of effort, it is not surprising that Alaska is the only region of the United States in which subsistence uses of forest lands are well documented. Subsistence priorities are guaranteed on virtually all of the 375 million acres of forested land in Alaska. The Alaska Department of Fish and Game, Division of Subsistence, reported that in 2000, 60 percent of households in the rural communities that were surveyed harvested game while 83 percent harvested fish (Wolfe 2000). The Alaska literature consistently emphasizes the prevalence and importance of sharing subsistence goods (Johnson 1998; Schroeder 2002). Thus, the number of households benefiting from subsistence harvesting is greater than the number of households that harvest. In 2000, 86 percent of surveyed households used game and 95 percent used fish (Wolfe 2000).

Subsistence use of plant materials in Alaska has been less extensively documented. However, gathering is also important in the state (Johnson 1998; Schroeder 2002). In contrast to hunting and fishing, where sport and commercial activities take substantial portions of the total catch (Wolfe 1999), subsistence and personal use account for virtually all contemporary nontimber uses of plant materials (Schroeder 2002). The most common subsistence use of plants is for food. Other uses include medicinal, craft, and construction. Recent surveys of communities in southcentral and southeast Alaska indicate that 80 percent or more of households participate in the subsistence harvest and use of vegetation. The USFS in Alaska is developing management directions that will protect these subsistence uses in National Forests lands and limit the effects of possible commercial exploitation of forest plants.

#### *New England and New York*

Reliance on natural resources in rural New England and upstate New York is common, particularly in economically depressed pockets of the region. In 1989, Glass and Muth (1989a) reported that there were 235,000 low income rural households in New England that needed to supplement their incomes. In parts of the Northeast where the formal economy does not fully support the needs of residents, forest resources enable families to get by. Horwitz's (1993) profile of a minimum-wage earner in northern Vermont illustrates the importance of the forest for subsistence needs: "This payday, the choice is clear: He's two weeks late on the rent, and the fuel tank must be filled. Unable to afford food, he will hunt for it" (p. 1A).

A study of trappers in the northeastern United States (Muth et al. 1996) found that, "a small but not insignificant proportion of the sample (trappers surveyed) may be highly dependent on trapping for the provision of income and in-kind subsistence contributions to the household economy" (p. 430). Seven percent of trappers surveyed agreed with the statements: "I rely on food harvested to feed my family," and "I depend on bartering to support my family". An additional 5 percent agreed strongly these statements. In a Massachusetts survey of deer hunters, Muth et al. (2001) found that 7 percent of respondents indicated that subsistence was their primary motivation for hunting. Other researchers in the Northeast report the existence of an invisible economy that is based in part on barter and trade of natural resources (More et al. 1993; Mason 1990). The social network provided by exchange of gifts and bartering in these types of invisible economies maintains and reinforces psychological and sociocultural functions that have been identified as key components of subsistence economies (Glass and Muth 1989b).

#### *West Virginia*

Each spring, residents of rural West Virginia begin what Hufford (2000) describes as a seasonal round of resource use that includes gardening, hunting, and gathering of non-timber forest products for subsistence and commercial purposes. Use of the forest's multiple products is rooted in local traditions and knowledge. The forest and its products are central to the material and psychological well-being of many in rural West Virginia. Decrying the recent effects of mining and logging in the region, one of Hufford's (1995) interviewees said: "They're taking away our dignity by destroying our forest." As Glass et al. (1990) note, subsistence use of natural resources often supports important psychological and cultural aspects of society. Hufford's (2000) documentation of life in rural West Virginia demonstrates that household economies depend on a social network featuring use and exchange of natural resources.

Important local social traditions revolve around forest products, such as ramp (wild onion - *Allium tricoccum*) festivals, and the social bonds formed through gathering and food processing, particularly among women, maintain ties to kin, community, and place.

### *Kentucky*

Halperin (1990) found subsistence to be part and parcel of rural life and rural culture in Kentucky. She notes: "For both men and women, knowledge of the local ecology is essential for knowing when and how to hunt, fish and gather. Hunting and fishing are not mere sport in this area; they provide essential protein" (p. 11). Halperin cites an interview with one rural Kentucky man who makes clear the importance of natural resources: "I need worms for fishing. That's what I do when I have time; and we need those fish. My wife some of the time says that if it wasn't for the fish I catch, we'd all be gone by now" (p. 68). The mixed economy of rural Kentucky, which includes subsistence gardening, hunting, fishing, gathering, and occasional stints of work in the formal economy, permits the continuation not only of a way of life, but also helps maintain bonds to kin and land. In a region where Halperin reports that "virtually no one works in any single sector on a full-time basis for a lifetime" (p.7), subsistence use of natural resources strengthens community exchange networks and allows people to make ends meet.

### *Alabama*

A survey of freshwater anglers in Alabama, conducted in 1992 and 1993, looked at the daily per capita fish consumption of that state's recreational and subsistence fishing publics (FIMS and FAA 1994). The survey found that 22 percent of the interviewed anglers could be classified as living in poverty (less than \$15,000 annually for a family of 4). The annual estimate of daily per capita freshwater fish consumption was notably higher among lower income groups than higher income groups. The report (FIMS and FAA 1994) states that "there was a tendency for upper income white anglers to eat roughly 70% as much fish as poverty level white anglers, whereas upper income black anglers ate only about 20% as much fish as poverty level black anglers (p. 18-19)... The highest estimates of consumption were associated with people older than 50 years (76 grams/day), and with black anglers whose annual family incomes were less than \$15,000 (63 grams/day)" (p. 24). This survey clearly shows that lower income families and retired persons rely greatly upon freshwater fish resources.

### *Southwestern Louisiana*

Studies of game wardens and poachers in southwestern Louisiana uncovered evidence of a continuing subsistence lifestyle, particularly among residents of French-Acadian origin (Forsyth et al. 1998). Of 41 poachers surveyed, 37 indicated that providing food and other products for their families was one of their primary reasons for poaching. Statements by interviewees confirm that subsistence needs often motivate poaching (Forsyth and Marckese 1993) (note that the use of the word "outlaw" below is used as a verb to connote poaching):

"I outlaw when ever I get a chance so I can eat."

"I outlaw because I'm low on my funds. I only outlaw enough to make a dinner."

"I'm not proud to outlaw and I don't advise anyone to do it, but when you're hungry and you got to have some meat on the table, I outlaw and that's a fact." (pp. 22 and 24).

Forsyth et al.'s (1998) interviews with sympathetic game wardens confirm that some individuals in southwestern Louisiana are hunting for basic subsistence needs:

"Some do it to survive. That is a hard way to make it. They are hard working guys. You do it for survival, I cut you slack."

"People poach for many reasons. Sport. Money for drug habits. Those I go after. A number do it as a form of survival or for putting food on the table. Those I let go."

"That old man in the swamp. We are not worried. He only kills deer to eat. Without it, I don't think he could make it. Also, it is part of his life and culture."

"I don't really go after old timers who are doing it for survival." (p. 33)

While the numbers of people in rural southwestern Louisiana who depend on wild game for subsistence are not quantified, the studies above bespeak the presence of rural residents in the region for whom game is a vital subsistence resource.

### *Mississippi*

Brown et al.'s (1998) study of rural residents in the Mississippi Delta region found a functioning rural economy that relied on subsistence strategies to survive in an economically depressed region of the country. A large number of interviewees reported that they engaged in hunting, fishing, gardening, animal husbandry, and gathering of wild plants (Brown et al. 1998). Such activities allowed residents to survive in the mixed economy of a region ill served by the formal economy.

### *Missouri*

Residents of the Missouri Ozarks have long relied on natural resources to meet basic needs. De Jong (2001) writes of the town of Steelville, MO, "The homesteaders who arrived in the 1830s counted on deer, turkeys, and squirrels to augment their minuscule harvests of beans, taters, and corn, and with more than half the current households taking in less than \$15,000 a year, a lot of Steelvillians still do" (p. 116). Located in an economic backwater, residents of the Ozarks, like other rural areas of the country, have maintained subsistence skills to ensure survival in the uncertain formal economy. "America's culture is about getting rich," writes de Jong (2001). "Steelville's is about getting by. It's one of the few places left in the continental United States where living on little more than skill and resourcefulness is not a disgrace but a point of pride" (p. 116). De Jong's interviews illustrate the realities of entire lives lived outside the official economy in the Ozarks.

### *Lake States*

Emery's work (1998, 2002) in the Upper Peninsula (UP) of Michigan found natural resources served as a buffer and refuge from the vagaries of the formal market. Of 42 gatherers surveyed, Emery (1998, 2002) found that less than half had formal employment and only nine held full time jobs. The forests in the region thus served as larder and medicine cabinet for many individuals. Subsistence use of natural resources in the UP allowed rural residents to make ends meet in an economically depressed location and was particularly critical for those between jobs or whose employment opportunities are chronically limited by age, gender, and/or disability.

### *New Mexico*

The mountains of northern New Mexico have been home to Chicano farmers since the 1600s. Using a blend of resource stewardship from the old and new worlds, Chicano farmers established what Peña (1999) describes as, "a living laboratory for the study of the interactions between cultural, social, economic, political, and ecological systems in a context characterized by limited resources and relatively low levels of mechanized technology (p. 113). In some New Mexico communities, production of goods for home and local use and exchange continues to be common. Subsistence reliance on agropastoralism, hunting, fishing, and gathering has allowed Chicano communities and culture to persist in a locale where formal employment is limited and the local economy is subject to economic boom and bust cycles. As Peña suggests that production for both subsistence and the market is one of the reasons for the endurance of Chicano farms and ranches.

### *Hawaii*

As previously noted, the traditional and subsistence rights of Native Hawaiians are recognized in and provided legal protection by the Hawaii's Constitution. Hawaii Volcanoes National Park permits Native Hawaiians to gather a number of fruits, leaves, barks and roots for traditional purposes. Native Hawaiians from the local community that now lies within park boundaries also are granted exclusive permission to engage in fishing (including commercial fishing) and collect seafood on the park's coastline.

“Kalapana extension area; special fishing privileges. (i) Pursuant to the act of June 20, 1938 (52 Stat. 781; 16 U.S.C. 391b and 396a), Native Hawaiian residents of the villages adjacent to the Kalapana extension area added to the park by the above act and visitors under their guidance are granted the exclusive privileges of fishing or gathering seafood from parklands (above the high waterline) along the coastline of such extension area. These persons may engage in commercial fishing under proper State permit” (National Archives and Records Administration, 2001, p. 89).

According to the Native Hawaiian Advisory Council (2002), common law in Hawaii also includes special provisions to protect traditional and customary Native Hawaiian subsistence activities. State courts have ruled to allow Native Hawaiians to enter private and public lands to exercise their traditional and customary subsistence, cultural, and religious practices in certain circumstances.<sup>6</sup>

### C. Interpretation of Data Relative to the Indicator Rationale

The data confirm that U.S. forests are used for subsistence purposes. However, a measurement of forests that are actually used for subsistence is difficult to obtain outside of locations where such practices are legally guaranteed. Because these areas represent only a portion of the forests so used, a landownership-based review of regulations that affect access to subsistence resources was used as a surrogate measure. This approach was deemed to yield an appropriate indicator for guiding forest policy since it addresses one important effect of management on subsistence practices. The data suggest that the legal availability of forests for harvest of subsistence resources may vary by land ownership and that, except where legally protected, there likely is a trend toward a diminishing subsistence land base. The data further suggest that concentrations of subsistence hunters, fishers, trappers, and gatherers may exist in indigenous communities and in rural regions with high forest cover and low household incomes. There may also be meaningful subsistence use by poor urban residents and recent immigrants.

### D. Data Limitations

Excellent longitudinal data on subsistence use of fish and game exist for Alaska, but less information is available for subsistence use of plant materials. Such data are lacking almost completely outside Alaska. However, small-scale surveys provide localized quantitative measures of participation in subsistence activities and ethnographic research has yielded rich descriptions of the nature and meaning of these practices for a variety of cultural groups throughout the nation.

### E. Options for Obtaining Additional Data

Some quantitative data are being collected but the coverage is inadequate to provide a complete measure of the area and percentage of forests used for subsistence throughout the United States. The Alaska context is legally and demographically unique from that of the rest of the nation. However, outstanding protocols for collection of data should be amenable to use elsewhere. Should further quantification of this indicator be desired, we would propose following the Alaska model to the extent that financial resources and policy needs dictate.

### F. Clarification of Meaning of the Indicator and Definition of Terms

This indicator report begins with a clarification of the definition of subsistence within the U.S. context. The characteristics of subsistence in the United States and the rationale for Indicator 47 suggest the need to expand data collection for this indicator to include identification of groups of subsistence users, uses, and volumes.

## II. Issues Of Concern

Social/political: As noted by the Roundtable on Sustainable Forests Technical Work Group (Sustainable Forests 2000), there is sensitivity to collecting data on management, access, etc., for both public and private lands. People engaged in subsistence activities may be reticent to share such information. Data collection efforts will be most successful if they are grounded in the spirit of the Indicator 47 rationale, quoted on page 1 of this report.

Economic: The size of the subsistence effort in Alaska indicates that an intensive data collection effort for Indicator 47 would necessarily be both expensive and long term. However, modest, well-targeted research efforts have the potential to provide significant insights into and data on subsistence use of U.S. forests.

Institutional: Again, as noted by the Roundtable on Sustainable Forests Technical Work Group (Sustainable Forests 2000), specially trained people are needed to collect and analyze information on subsistence uses of forests. A modest cadre of researchers in academe and governmental and nongovernmental organizations have experience that could be employed to collect data consonant with the Indicator 47 rationale.

### III. Cross-Cutting Issues/Relationships With Other Indicators

- Biodiversity & Conservation: 2, 3, 4, 5, 6, 8
- Non-timber Forest Products: 14, 30, 34
- Wildlife: 6, 7, 8,
- Water Quality: 20, 23, 24, 25
- Forest Health & Monitoring: 15, 17, 60, 61, 66, 67
- Recreation: 35, 37
- Human needs and values: 42, 46, 65,
- Legal and institutional frameworks: 3, 4, 48, 49, 50, 51, 52, 53, 54, 57

Forthcoming

### IV. Suggested Guidance On Data

Forest Inventory and Analysis data on area and percentage of forest land ownerships and forest cover.  
Census Bureau data to target studies to areas with likely concentrations of subsistence users.

#### Footnotes

1. Leslie Marler, personal communication, February 2002.
2. Scott Turner, personal communication, January 2002.
3. Mark Jacobs, personal communication, January 2002.
4. Note that although the name of the organization emphasizes fish and wildlife, the American Indian and Native American Fish and Wildlife Organization programs also include important programs on culturally significant plants. For further information, see <http://www.nafws.org>.
5. See for example:
  - Alaska Federation of Natives <http://www.nativefederation.org/flash.html>
  - Alaska Intertribal Council <http://www.aitc.org/>
  - Central Council of Tlingit and Haida Tribes of Alaska <http://www.ccthita.org/>
  - Association of Village Council Presidents <http://www.avcp.org/>
  - Tanana Chiefs Conference, <<http://www.tananachiefs.org/>
  - Sitka Tribe of Alaska, <http://www.sitkatribes.org/>.)

6. See the Native Hawaiian Advisory Council website for additional information (<http://www.pixi.com/~nhac>).



## REFERENCES

- Alt, D.; Hodgson, W.; Ferrise, A.; Colyer, D. 1989. **Preliminary report: statutory trespass/liability law in the eastern United States.** West Virginia Extension Service Publication R.D. No. 746. Morgantown, WV: University of West Virginia.
- Bureau of Indian Affairs. 2002. **Catalog of forest acres.** Lakewood, CO: U. S. Department of Interior, Bureau of Indian Affairs, Forest Resources Planning.
- Bureau of Land Management. 1994. **Special forest products procedure series.** BLM Manual Supplement Handbook 5400-2. Portland, OR: U.S. Department of Interior, Bureau of Land Management.
- Brown, R.B.; Xu, X.; Toth, J. F., Jr. 1998. **Lifestyle options and economic strategies: Subsistence activities in the Mississippi Delta.** Rural Sociology. 63 (4): 599-623.
- Capozzi, S.; Dawson, C. P. 2001. **Recreational leasing of industrial forestlands in New York State.** In: Gerard, K., comp. ed. Proceedings of the 2000 northeastern recreation research symposium, 2001 April 1-3: Bolton Landing, NY. Gen. Tech. Rep. NE-276. Newtown Square, PA: U. S. Department of Agriculture, Forest Service, Northeastern Research Station: 11-19.
- City of New York Department of Environmental Protection. 2001. **New York City's water supply system: Recreation conditions on water supply lands.** Online: [www.ci.nyc.ny.us/html/dep/html/ruleregs/wsrecreation.html](http://www.ci.nyc.ny.us/html/dep/html/ruleregs/wsrecreation.html) (viewed 1/20/02).
- Community Resources. 2000. **Working paper: Exploring the value of urban non-timber forest products.** Baltimore, MD: Community Resources.
- Cordell, H. K.; Bergstrom, J. C.; Hartmann, L. A.; English, D. B. K. 1990. **An analysis of the outdoor recreation and wilderness situation in the United States: 1989-2040** Gen. Tech. Rep. RM-189. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. \_\_\_\_p.
- De Jonge, P. 2001. **Steeleville, Missouri, 65565: The middle of America (ZipUSA feature).** National Geographic. 200 (5): 114-122.
- U. S. Department of Defense. 1996. **Instruction 4715.3, environmental conservation program.** Online: [www.denix.osd.mil](http://www.denix.osd.mil)
- Dwyer, J. F.; Nowak, D. J.; Noble, M. H.; Sisinni, S. M. 2000. **Connecting people with ecosystems in the 21st century: An assessment of our nation's urban forests.** Gen. Tech. Rep. PNW-GTR-490. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Emery, M. R. 1998. **Invisible livelihoods: Non-timber forest products in Michigan's upper peninsula.** New Brunswick, NJ: Rutgers University. Ph.D. Dissertation.
- Emery, M. R. 2002. **Space outside the market: Implications of NTFP certification for subsistence use - A northern case study from the upper peninsula region, USA.** In: Shanley, P.; Pierce, A. R.; Laire, S. A.; Guillen, A., eds. Tapping the green market: Certification and management of non-timber forest products. London, UK: Earthscan/WWF People and Plants Program: pp \_\_\_\_.

Fishery Information Management Systems, Inc. and Department of Fisheries and Allied Aquacultures – Auburn University. (FIMS/FAA) 1994. **Estimation of daily per capita freshwater fish consumption of Alabama anglers.** Auburn, AL: Auburn University Press.

Forsyth, C. J.; Marckese, T. A. 1993. **Folk outlaws: Vocabularies of motives.** International Review of Modern Sociology. 23: 17-31.

Forsyth, C. J.; Gramling, R.; Wooddell, G. 1998. **The game of poaching: Folk crimes in southwest Louisiana.** Society and Natural Resources. 11: 25-28.

Glass, R. J.; Muth, R. M. 1989a. **Conflicts between recreation and subsistence use of fish and wildlife in New England.** In: More, Thomas A.; Donnelly, Maureen, P.; Graefe, Alan R.; Vaske, Jerry J., eds. Proceedings of the 1989 northeastern recreation research symposium, 1989 April 3-5; Saratoga Springs, NY. Gen. Tech. Rep. NE-132. Broomall, PA: U. S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 101-106.

Glass, R. J.; Muth, R. M. 1989b. **The changing role of subsistence in rural Alaska.** Transactions of the 54<sup>th</sup> North American wildlife and natural resources conference. Washington, D.C.: Wildlife Management Institute: 224-232.

Glass, R. J.; Muth, R. M.; Flewelling, R. 1990. **Distinguishing recreation from subsistence in a modernizing economy.** In: Vining, J., ed. Social science and natural resource recreation management. Boulder, CO: Westview Press: 151-164.

Halperin, R. 1990. **The livelihood of kin: Making ends meet “the Kentucky way”.** Austin, TX: University of Texas Press.

Hawaii Volcanoes National Park Compendium. 1999. Hilo, HI.

Horwitz, T. 1993. **The working poor: Minimum-wage jobs give many Americans only a miserable life.** The Wall Street Journal (Eastern Edition), November, 12, 1993, p. 1A, 4A.

Hufford, M. 1995. **Stalking the mother forest: Voices beneath the canopy.** Coal River folklife project. Online: (<http://memory.loc.gov/ammem/cmnshtml/cmnshtml.html>). Folklife Center News, American Folklife Center, Washington, D.C: Vol. 17, No. 3.

Hufford, M. 2000. **Tending the commons: Folklife and landscape in southern West Virginia.** Coal River folklife project. Online: (<http://memory.loc.gov/ammem/cmnshtml/cmnshtml.html>). Folklife Center News, American Folklife Center, Washington, D.C.: Library of Congress.

Jacobs, M. 2002. Personal communication. Assistant Land Commissioner, Aitkin County Land Department, MN.

Johnson, D. R.; Hunn, E.; Russell, P.; Kamp, M. V.; Searles, E. 1998. **Subsistence uses of vegetal resources in and around Lake Clark national park and preserve.** NPS/CCSOUW/NRTR-98-16. Seattle: National Park Service.

Kaiser, R. A.; Wright, B. A. 1985. **Recreational access to private land: Beyond the liability hurdle.** Journal of Soil and Water Conservation. 40 (6): 478-481.

- Marsinko, A.; Guynn, D.; Roach, D. F. II. 1998. **Forest industry hunt-lease programs in the South: Implications for managers.** In: Vogelsong, H. G., comp, ed. Proceedings of the 1997 northeastern recreation research symposium; 1997 April 6-9; Bolton Landing, NY. Gen. Tech. Rep. NE-241. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 141-143.
- Mason, D. A. 1990. **Vermont's other economy: The economic and socio-cultural values of hunting, fishing, and trapping for rural households.** Burlington, VT: University of Vermont. Masters thesis.
- Messmer, T. A.; Dixon, C. E.; Shields, W.; Barras, S. C.; Schroeder, S. A. 1998. **Cooperative wildlife management units: Achieving hunter, landowner, and wildlife management agency objectives.** Wildlife Society Bulletin. 26 (2): 325-332.
- Midwest Regional Waterfall Management Taskforce. 2002. **Circle of flight: Tribal wetland and waterfall enhancement initiative.** Des Moines, IA: Midwest Regional Waterfall Management Taskforce.
- More, T. A.; Glass, R. J.; Zwick, R. R. 1993. **Fish and wildlife resources allocated through the invisible economy of rural New England.** In: Thompson, I. E., ed. Proceedings of the XXI international union of game biologists, 1993 August 15-20, Halifax, Nova Scotia, Canada: Chalk River, Ontario, Canada, Canadian Forest Service: 1:175-180.
- Muth, R. M.; Ruppert, C. E.; Glass, R. J. 1987. **Subsistence use of fisheries resources in Alaska: Implications for Great Lakes fisheries management.** Transactions of the American Fisheries Society. 116: 510-518.
- Muth, R. M.; Daigle, J. J.; Zwick, R. R.; Glass, R. J. 1996. **Trappers and trapping in advanced industrial society: Economic and sociocultural values of furbearer utilization in the northeastern United States.** Sociological Spectrum. 16: 421-436.
- Muth, R. M.; Dick, R. E.; Blanchard, K. A. 2001. **Subsistence use of wildlife and Native peoples' wildlife issues.** In: Decker, D. J.; Brown, T. L.; Siemer, W. F., eds. Human dimensions of wildlife management in North America. Bethesda, MD: The Wildlife Society: 329-351.
- National Archives and Records Administration. 2000. **Federal Registry.** Washington, D.C.: National Archives and Records Administration.
- National Archives and Records Administration. 2001. **Code of Federal Regulations, Title 36, Parts 1 to 199: Parks, forests, and public property.** Washington, D.C.: National Archives and Records Administration.
- National Research Council. 1998. **Forested landscapes in perspective: Prospects and opportunities for sustainable management of America's nonfederal forests.** Washington, D.C.: National Academy Press.
- Native Hawaiian Advisory Council. 2002. Online: [www.pixi.com/~nhac](http://www.pixi.com/~nhac)
- Patterson, R.; Patterson, M. 1989. **Land lease sporting rights for "rent".** American Forests. 95: 55-58.
- Peña, D. G. 1999. **Cultural landscapes and biodiversity: The ethno-ecology of an upper Río Grande watershed commons.** Pages 107-132 in: Nazarea, V. D., ed. Ethnoecology: Situated knowledge/located lives. Tucson, AZ: University of Arizona Press.

Pevar, S.L. 1992. **Hunting, fishing, and gathering rights.** Pages 189-208 in: Pevar, S.L. The rights of Indians and tribes: The basic ACLU guide to Indian and tribal rights. Carbondale:Southern Illinois University Press.

Pollak, S. **Posted: The Vermont dilemma.** Burlington (VT) Free Press, 2001 October 14; Sections 1D, 7D.

Pratt, J. R.; Tolman, D.; Sutton, L; Doppelt, R. 2000. **Summary of current status and health of Oregon's urban ecosystems.** Salem, OR: Oregon Progress Board. The Oregon State of the Environment Report 2000.

Schroeder, R. 2002. **Contemporary subsistence use of NTFP in Alaska.** In: Jones, E. T.; McLain, R. J.; Weigand, J. F., eds. Nontimber forest products in the United States. Lawrence, KS: University Press of Kansas.

Siemer, W. F.; Brown, T. L. 1993. **Public access to private land for hunting in New York: A study of 1991 landowners.** Human Dimensions Research Unit, Series No. 93-4. Ithaca, NY: Cornell University.

Smith, W. B.; Vissage, J. S.; Darr, D. R.; Sheffield, R. M. 2001. **Forest resources of the United States, 1997.** Gen. Tech. Rep. NC-219. St. Paul, MN: U. S. Department of Agriculture, Forest Service, North Central Research Station.

Sustainable Forests. 2000. **Roundtable on sustainable forests.** Sustainable Forests. Vol. 2001.

Turner, So. 2002. **Aitkin County, Minnesota regulation of hunting, fishing, and gathering.** Personal communication.

U.S. Fish and Wildlife Service. 2001. **Annual report of lands under control of the U.S. Fish and Wildlife Service as of September 30, 2001.** Washington, D.C.: U.S. Department of the Interior/U.S. Fish & Wildlife Service.

Washington State Department of Natural Resources. 2001. **Sutherland closes state forest for "meth" lab cleanup, investigation.** Olympia, WA: Washington State Department of Natural Resources. News Release dated April 27, 2001.

West's. 1998. **West's encyclopedia of American law.** St. Paul, MN: West Group. 290-297.

Whistler, A. 2002. **Regional Forester.**

Wolfe, R. 1999. **Subsistence: Frequently asked questions. vol. 2002.** Alaska Department of Fish and Game.

Wolfe, R. J. 2000. **Subsistence in Alaska: A year 2000 update, vol. 2002.** Division of Subsistence, Alaska Department of Fish and Game.